

## DISEASES AND ABNORMALITIES OF THE FEMALE URETHRA

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*The frequency with which pathologic conditions are found in the female urethra and the necessity for a careful examination of this organ in the presence of symptoms referable to the urinary tract is worthy of emphasis.*

DISCUSSION by Nathan G. Hale, Sacramento; P. N. Jacobson, Oakland; Anders Peterson, Los Angeles; Herbert A. Rosenkrantz, Los Angeles.

THE female urethra is too often considered merely as an avenue of approach to the bladder and upper urinary tract and the frequency of lesions of this organ completely overlooked in the consideration of the etiology of urinary disturbances so common in this sex. The fallacy of this conception is demonstrated by the large number of patients with urinary symptoms, due exclusively to pathological conditions of the urethra.

In Bugbee's<sup>1</sup> statistics, which comprise 1000 cases of frequency of urination in women, lesions of the urethra were present in 690 instances. In a study of the last 234 consecutive female patients complaining of various urinary disturbances that have come under my observation the urethra was wholly responsible for the symptoms in 56 and partly responsible in 173 instances.

The lesions encountered were: stricture in 120 patients, urethritis in 68, caruncle in 8, polypi in 7, papillomata in 5, prolapse in 2, hypospadias in 2, calculus in 1, and urethrocele or diverticulum in 1.

### URETHRAL GLANDS

Contrary to popular opinion the female urethral mucosa contains a large number of small mucous glands and lacunae. These are more numerous anteriorly. On the posterior wall of the urethra, usually just within the external meatus, lie the two openings of Skene's glands. The orifice of another large gland on the anterior wall near the external meatus is frequently infected and should not be overlooked. Skene's glands are occasionally located outside the meatus. Additional paraurethral ducts and glands are sometimes found external to the urethral orifice. Contrary to the experience of some observers I find Skene's glands are often infected.

### EXAMINATION OF THE FEMALE URETHRA

The urine should be held for several hours before examination if possible.

With the patient in the dorsal position the labia are separated at their upper margins with the thumb and index finger of the left hand and the meatus cleansed with sterile gauze. Pressure is then made on the meatus between the left thumb and right index finger and discharge, if any, obtained for examination. Following this the urethra is carefully palpated. It is then milked from behind forward and any excretion appearing at the meatus is transferred to glass slides by means of a platinum loop or cotton-tipped applicator for examination. Even in the absence of visible discharge urethritis is frequently present.

If properly performed, the two-glass test is a

valuable diagnostic procedure. Following thorough douching of the vagina and cleansing of the vulva the urine is passed into two glasses. With infection limited to the urethra, the first glass will be turbid, often contain threads, and pus cells will be found on microscopic examination. Unless the discharge is very profuse the second glass will be clear.

The urethra is next calibrated with olive-tipped bougies, and if a stricture is found it is treated as described under stricture of the urethra before further examination is made.

Following calibration the anterior third of the urethra is examined through a Moore skenescope. This instrument is also a most useful adjunct in the treatment of lesions of this portion of the canal.

The patient is then catheterized and in the absence of stricture placed in the knee-chest position for urethroscopy. I have found the McCarthy anterior urethroscope which has the lamp at its distal extremity, or the Kelly urethroscope using light reflected by means of a head mirror very satisfactory for this purpose.

Water dilating, near vision instruments, such as the McCarthy cystourethroscope or the Brown-Buerger universal cystoscope are most valuable for the deeper portion of the urethra. Papillomata, polypi, and other pedunculated growths which may lay against the urethral wall and may consequently be overlooked, will be seen floating in the field with these types of instruments. The detection of chronic urethritis without discharge, which is very common in women, is impossible without urethroscopy.

### URETHRITIS IN THE FEMALE

Although usually caused by infection with the gonococcus, urethritis due to other organisms such as the colon bacillus is by no means uncommon. The proximity of the female urethra to the vagina and rectum often is responsible for ascending infections. In the examination of approximately 1064 women arrested for prostitution or vagrancy<sup>3</sup> with gonorrhea of the cervix, urethra including Skene's glands or the Bartholin glands, the majority chronic, gonococci were found in the urethral secretion in 32 per cent. When gonorrhea is present the percentage of urethral infections is considerably greater in virgins or those whose vagina is less readily entered. The urethral glands, especially those of Skene, are very frequently involved and it is to infection of these structures that the prolongation of the disease and its resistance to treatment is usually due.

### MALFORMATIONS

With one exception, a narrowing or stricture at the external meatus, congenital defects of the female urethra are much less common than in the male.

### HYPOSPADIAS

Although comparatively rare in the female a number of cases of this condition have been reported. As in the male it is due to defective development of the anterior urethral wall, and the position of the external urethral meatus may be but slightly posterior to its normal location or the entire urethral wall may be absent; the condition then resembling a vesicovaginal fistula. In a patient recently seen at

the San Francisco Polyclinic the meatus was located 3.5 cm. behind its usual position; another hypospadias had resulted from an operation for a growth on the clitoris some years before coming under my observation. As in hypospadias in the male the meatus is frequently constricted and all of the symptoms accompanying urethral stricture may then be present. If the meatus opens into the vagina dribbling is a prominent symptom and the skin of the vulva and thighs is often excoriated. Cases have been reported of extensive defect of the anterior urethral wall with involvement of the sphincter and incontinence of urine.

A constricted meatus should be incised unless it yields readily to dilatation. If the defect in the urethral wall is extensive, reconstruction by plastic operation is advisable. This is accomplished by bringing together over a catheter two lateral flaps of the vaginal mucosa sufficiently long to replace that portion of the urethra which is missing.

#### EPISPADIAS

This malformation, which is due to defective development of the anterior urethral wall, is likewise rare in the female. When it exists the meatus may be located just below the clitoris, just above the clitoris, or the urethra may open behind the symphysis; a type of deformity usually associated with separation of the pubic bones, partial or complete extrophy of the bladder and defective sphincters. Partial incontinence of urine usually accompanies the second, and complete incontinence the latter type of epispadias; the adjacent skin is usually badly irritated.

In the second and third types of epispadias accompanied by partial or complete incontinence, restoration of the sphincters by plastic operation has been recommended, but exclusion of the bladder and urethra and transplantation of the ureters or nephrostomy is usually necessary.

#### DOUBLE URETHRA

Instances of complete and incomplete double urethra have been reported. Dannreuther's patient<sup>2</sup> had a complete double urethra with a caruncle at one of the meati. She complained of frequency of urination accompanied by a burning sensation, which disappeared, however, after removal of the caruncle. Absence of the urethra and atresia of the urethra have been reported, but are extremely rare.

#### STRICTURE OF THE FEMALE URETHRA

Strictures of the urethra are now beginning to receive the recognition they deserve as important etiologic factors in genitourinary tract disturbances in women and female children. The significance of urethral obstructions as factors in the production and prolongation of urethral infections seems obvious when we take into consideration the fact that the urethral orifice is often bathed in purulent secretion without producing urethritis in the normal urethra and the immediate improvement which follows dilatation in an urethritis associated with stricture. While comparatively uncommon in the deeper portion of the canal, strictures are often

found at or just inside the meatus. Obstructions at this point, whether congenital or acquired, are responsible for symptoms which improve rapidly under dilatation.

Strictures of the urethra of inflammatory origin usually occur at or just within the meatus, and the most common etiological factors are infection, usually gonorrheal, and ulceration. Strictures caused by trauma are found both at the meatus and in the lumen of the canal, and are usually the result of childbirth or operative procedures.

Frequent urination is the most common symptom of which these patients complain. It occurred in over 85 per cent of my patients. The next most frequent complaint is pain, which may be referred to the urethra, bladder, sacral, inguinal, or one or both lumbar regions. Burning or smarting, urgency, difficulty, constant desire to urinate, partial incontinence and dribbling are occasionally present. Residual urine is seldom found except in the presence of very tight strictures.

Although a stricture can be seen through the urethroscope, and is often palpable through the vagina, the diagnosis is best made by means of the olive-tipped bougie. A sound, or urethrotome, is much less reliable, as strictures of the female urethra usually yield readily to slight pressure, and consequently higher readings result from use of the latter instruments. Ordinarily no "hang" or "tug" should be detected on withdrawal of a F. 26 bougie through an unobstructed urethra.

It is not unusual to find the voided urine of patients with strictures chemically and microscopically negative, although as a rule it contains a few pus cells, owing to the urethritis and trigonitis with which it is commonly associated. Often symptoms ascribed to some other condition, such as ureteral stricture, are due to an urethral obstruction.

Although rapid dilatation is occasionally indicated, the majority of urethral strictures should be treated by means of gradual dilatation, absorption of the constricting exudate being best promoted by this procedure. Meatotomy, internal urethrotomy or external urethrotomy with resection of scar tissue are sometimes necessary. A straight dilator or sound of the same size as the stricture is first introduced. The sounds are increased two numbers at each treatment until an F. 30 passes without difficulty. It is advisable to avoid marked trauma or severe pain following treatment. After the withdrawal of the sound a few cc. of 10 per cent argyrol or 1 to 3 per cent silver nitrate solution are injected. At first treatments should be given twice a week, but the interval is gradually lengthened to once a month and then often may be discontinued. Preceding dilatation the use of a local anesthetic, such as a 10 per cent solution of cocaine on a cotton-tipped applicator is often advisable, especially in nervous women.

The majority of strictures are soft infiltrations in which the symptoms improve, as a rule, after two and disappear after five treatments, recurrence being very unusual if treatment is not too abruptly discontinued.

In the presence of many of the hard infiltrations

internal urethrotomy is often advisable, otherwise dilatation is necessary at frequent intervals for an indefinite period of time.

#### NEOPLASMS OF THE FEMALE URETHRA

The common benign tumors of the female urethra are the polyp, papilloma, and caruncle. The malignant tumors are the carcinoma and sarcoma. The former is uncommon and the latter very rare.

#### POLYPI AND PAPILLOMATA

Polypi and papillomata are finger or fern-like projections from the surface of the mucosa. They are quite common and are usually located in the proximal third of the urethra just outside of the bladder sphincter, although sometimes found at the external meatus or in the middle or lower third of the canal. They are probably due to irritation from an accompanying or pre-existing infection, although frequently seen in an otherwise normal urinary tract. They may attain considerable size without causing symptoms. At other times they are responsible for frequent and painful urination, and if grasped by the internal sphincter may produce severe irritation and considerable bleeding. In one of my patients with three polypi located at the external meatus, bleeding occurred spontaneously on two occasions and also followed urethroscopy. In many patients with polypi at the bladder sphincter who have come under my observation, subjective symptoms were absent. As previously stated they are readily seen through a close-vision urethroscope using water dilatation, but are frequently overlooked if only the ordinary urethroscope is used, as they often lay flat against the urethral wall which they closely resemble.

H. R. Schmidt recently reported a very unusual case in which a tumor of the urethra the size of a plum caused the anterior wall of the vagina to protrude. It consisted of five large and four small polypi beneath which, in the urethral submucosa and muscularis, lay numerous cysts varying in size up to 2 millimeters. The patient had been treated for years with strong caustics. Cystic formations in the wall of the female urethra are very rare.

#### CARUNCLES

Caruncles are usually the product of chronic inflammation of the mucous membrane of the urethra. They cause more discomfort and pain than any other urethral growths. They are prone to recur even after most radical treatment and many consider them to be potentially malignant. They are responsible for frequent and painful urination and are usually extremely sensitive. Neurasthenia and loss of weight are not uncommon, although caruncles may exist without subjective symptoms.

Following the application of a 10 per cent solution of cocaine, they may be satisfactorily removed by fulguration or diathermy, although the clamp and cautery as suggested by Ferrier or the clamp and acid nitrate of mercury used by Crenshaw have given excellent results in their hands. If the base is not destroyed caruncles usually return.

One of my patients, 67 years of age, complained of painful and frequent urination of over twenty years' duration. She was extremely nervous, weak

and somewhat emaciated. Examination revealed three exquisitely sensitive urethral caruncles at the lower margin of the meatus. Her urinary symptoms disappeared and the others showed marked improvement following fulguration of these growths.

#### CARCINOMA OF THE FEMALE URETHRA

Although uncommon, primary carcinoma of the female urethra occurs occasionally; usually in patients over 40 years of age.

Chronic inflammation of the mucosa at the meatus or in the canal is believed to be an important etiologic factor. The most prominent symptoms of carcinoma are bleeding from the urethra and burning during urination. Difficulty in urination, pain and frequent urination are occasionally present. Examination reveals either a papillomatous growth at the external orifice or an irregular mass along the urethral wall which may or may not be ulcerated.

If treatment is begun early the prognosis is not hopeless. Partial or total excision of the urethra has been advised, but with a carcinoma so far advanced as to require such a radical operation as total excision the prognosis is so unfavorable that it is a question if such a procedure is justifiable. Diathermy, radium, or both are probably preferable.

Corbus and O'Connor<sup>5</sup> have reported some good results from diathermy. I have seen two patients who had been treated with radium. One was alive one year, and the other five years after treatment without evidence of recurrence. The last patient, a widow 35 years of age, seen on March 7, 1921, complained of burning during urination and an aching sensation at the external urethral meatus of one week's duration. She had lost fifteen pounds during the preceding year. Examination revealed an ulcer involving the lower half of the external urethral meatus and an injected area extending backward along the floor of the urethra for about 2 cm. On March 8 she received 0.6 of neoarsphenamine and three days later 0.9. Examination on March 14 showed a slight increase in the size of the growth. As stated above she was in good health in March, 1926, five years after treatment with radium.

#### CALCULUS

Stones are rarely found in the female urethra because of the shortness of the canal, its lesser curvature and its greater distensibility. Although occasionally originating in the urethra, the majority have descended from the upper urinary tract and become lodged behind a stricture either at the external meatus or in the lumen of the canal or in a diverticulum.

The most common symptoms are frequent and painful urination, a constant desire to urinate, and a purulent discharge from the urethra.

If not seen on separation of the lips of the external meatus, calculi can be detected by inserting a metal instrument, such as an olive-tipped bougie or dilator into the urethra, by vaginal palpation or by a combination of these procedures. If it is impossible by means of a finger in the vagina to express

a calculus the stone may sometimes be grasped with forceps and removed following dilatation of the urethra. During instrumentation pressure with the vaginal finger behind the stone will steady it and prevent it from slipping back into the bladder. If too much force is required, however, an attempt should be made to push it back into the bladder where it may be crushed with a lithrotrite. If the calculus is lodged in a diverticulum it should be removed through a vaginal incision, the walls of the diverticulum being excised at the same time. Traumatism of the urethra, especially in the presence of an infected urine, is to be avoided.

A woman 50 years of age entered the Stanford Women's Clinic complaining of occasional attacks of painful urination. On vaginal palpation a hard mass was detected in the urethra just anterior to the bladder sphincter. Urethroscopy revealed a large calculus about 3 cm. from the external meatus. On attempting to remove the stone with urethral forceps it was broken into a number of fragments. Some bleeding followed this procedure. One week later the patient was free from symptoms and urethroscopy was negative. No calculi were found on radiography of the upper urinary tract.

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#### DISCUSSION

NATHAN G. HALE, M. D. (Capital National Bank Building, Sacramento)—A word of warning about overlooking the urethra is appropriate at this time, as Doctor Stevens ably points out to the urologists, and should also be seriously considered by the general practitioner. Urologists with experience are prone to examine this structure in a rather casual way, having their attention focused on abnormalities of the upper urinary tract.

The two-glass test is a valuable adjunct to the examination of the female urinary tract, and is not used as frequently as it should be. It is a variation of the usual technique in examining the female patient by most physicians.

Water irrigating cystourethroscope, for examining the urethra for pedunculated growths, is of utmost importance, as it brings into the field these papillary growths that the straight Kelly scope leaves flattened on the surface of the urethra and, therefore, often overlooked.

Cocain, 10 per cent strength, for a local anesthetic of the urethra, I am not familiar with, having been warned of its toxicity by experience of others. However, on a cotton-tip applicator that has been saturated with the solution there is probably less danger, but the use of a cocain solution in the urethra of any strength has always made me very apprehensive.

The paper is very timely, and it brings to my mind the old adage, not to put the cart before the horse, as we are very often prone to think of the kidneys first and the urethra last.

P. N. JACOBSON, M. D. (Medical Building, Oakland, California)—It will be seen from the study of Doctor

Stevens' 234 consecutive female patients complaining of various urinary disturbances that the lesions encountered in this series were: urethral stricture, 121, or 51.2 per cent, and urethritis, 68, or 29 per cent. Bearing in mind that the two lesions are commonly associated, we have then, of the total number of cases studied, approximately 80 per cent of these two conditions alone.

If Stevens had gone no further in his article than to emphasize the importance of urethral stricture in women as a disease entity his efforts would have been worth while; but he has considered in this contribution the various lesions of the female urethra in such a thorough manner that the article merits the serious consideration of the urologist and the general practitioner alike.

Urethral stricture is one of the most common as well as one of the simplest lesions to recognize of any of the disturbances occurring in this organ. I have seen instances in my own experience where patients have had symptoms of dysuria and frequency extending over a period of twenty years relieved by a single treatment. Further, I have seen patients subjected to bladder irrigations for a period of years, meanwhile the diagnosis being cystitis, with absolutely no relief of symptoms. Dilatation of the urethra as outlined in this article is the essential part of the treatment.

Trigonitis and urethrotigonitis is a condition observed in women that, while causing much suffering and misery, has apparently not received the attention it deserves. These inveterate sufferers may go on over a period of years complaining of undue frequency and urgency, never having had a urethrosopic examination, which offers the only means for positive determination of most of the lesions and diseases of the urethra.

An acute inflammation of the urethra is often accompanied with involvement of the contiguous bladder mucosa (cystourethritis, trigonitis, cervicourethritis), is a common condition, the etiology of which is obscure. Among the laity this condition is commonly known as "cold in the bladder." Exposure to cold, errors in diet, highly acid urine, alcoholic excesses may be the etiological factors in the production of this train of symptoms. In these cases the colon bacillus is most commonly found in the urine and in pus obtained from the urethra; and in many cases a history of intestinal disturbance preceding or coincident with the urethral and vesical symptoms is elicited. Staphylococci and streptococci occur in this form of urethritis. Hunner has called attention to the striking frequency of this urethral and vesical condition in association with tonsillitis, grippe, and pharyngeal infections.

The importance of microscopic examination in differentiating the type of urethral infections cannot be overestimated. No case of acute urethritis should be called gonorrheal until positive and authoritative demonstration of the gonococcus has been demonstrated in the exudate.

I have nothing to add to the method of obtaining these specimens for microscopic study other than the method outlined in this article. Doctor Stevens has given us an excellent description of the technique of the examination of the female urethra. The symptomology, diagnosis, and treatment of the various lesions described in this excellent paper deserves no further comment.

ANDERS PETERSON, M. D. (1136 West Sixth Street, Los Angeles)—I have read Doctor Stevens' paper with much interest and am left most strongly with the impression that I have not examined the female urethra with due care. Many women patients have undoubtedly been classified as neurasthenics following negative cystoscopic findings who were suffering from some lesion in the urethra. Particularly am I impressed with the large number of strictures reported, and I think that the reason for overlooking this condition is due to the fact that women rarely complain of urinary difficulty, but rather of painful urination.

In my own experience I recall many instances of difficulty in introducing the ordinary size cystoscope where it has been necessary to dilate the urethra with a sound of suitable size before cystoscopy could be carried out. In some of these patients no pathological conditions were

found in the bladder or kidneys, but the patients experienced almost immediate relief from their bladder irritation following such examination. Ordinarily I have not considered these cases as organic strictures, but rather thought them to be abnormally small urethras. Considering Stevens' findings and reports, these cases are undoubtedly organic contractions following either infections or trauma.

I feel both complimented and benefited in having this opportunity of reviewing this very complete essay.

HERBERT AUGUSTUS ROSENKRANZ, M.D. (W. P. Story Building, Los Angeles)—I have been much impressed with the system and completeness of Doctor Stevens' paper, which bears evidence of many revisions. One might compare it in this respect with the shorter stories of Balzac which, through their masterful technique, betray the many revisions and hard work that preceded the boiled-down, finished classic.

This paper is particularly timely, since we as urologists are too prone to concentrate on searching the kidneys and their immediate adnexae for abnormalities to the exclusion of the urethra in the female, although all of us learned early in our careers the folly of doing a male cystoscopy without having at hand also the complete urethrosopic armamentarium. The female urethra has been neglected urethroscopically and urethrometrically. Some practitioners for many years routinely dilated the female urethra for symptoms of irritable bladder. They did so empirically and not so infrequently got favorable results, little realizing that they were dilating an organic stricture.

Along this line it should be borne in mind that pain in the urethra, but with negative vulval, urethral and routine cystoscopic findings, is sometimes found on more thorough examination to be a referred pain caused by ureteral stricture. I appreciate the thoroughness of Stevens' paper all the more because some months ago I reviewed pretty thoroughly the available literature on the urethra in order to benefit an elderly lady who had had a very extensive growth removed from the vulva and urethra four years previously. After a number of urethrosopies and cystoscopies I finally relieved her by dilating a left ureteral stricture which had been the cause of a very distressing pain referred to the urethra.

Along with the use of the acorn-tipped bougie I have found palpation of the urethra with the finger to be of distinct value in the diagnosis of localized hard strictures and also of the fairly common chronic urethritis mentioned by Stevens, in which the whole urethral tube is uniformly and markedly thickened and increased in density.

I would like to call attention to a very much neglected but very effective treatment of chronic trigonitis and cystitis coli which conditions are occasionally complicated by a sensitive inflammatory condition of the urethra near the bladder neck. This condition is most frequently caused by a colon bacillus infection either ascending or descending. In my cases I have found it to be more frequently descending. It does not respond to bladder irrigation, although millions of bladder irrigations have been wasted upon these patients. The treatment was devised by Bierhoff while working in Knorrs' Clinic in Berlin, and is called "Knorrs' cauterization." A urethroscope is introduced into the bladder, thus emptying the bladder. A large cotton swab dipped in one-half of one per cent silver nitrate is introduced into the bladder, the urethroscope withdrawn, and the swab withdrawn after it. This procedure admits of a thorough application of the medicine to the diseased urethra as well as the bladder neck. The treatments should take place about every four days, increasing the strength of the silver nitrate one-half per cent each time up to tolerance, and according to result. The treatment may be somewhat painful, and I agree with Stevens, who remarks, "It is advisable to avoid severe pain following treatments." These patients should be given a hypodermic of some analgesic some minutes before the treatment. Neosilvol or argyrol should also be instilled into the bladder following the treatment on account of their soothing effect.

## THE INSULIN TREATMENT OF DIABETIC COMA

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SINCE the introduction of insulin recoveries from uncomplicated diabetic coma are so frequent that it is not regarded with sufficient concern by some physicians who fail to realize that even with insulin, coma patients recover only as the result of long hours of hard work by the doctors and nurses.

This paper is based on fifty-three cases of diabetic coma treated with insulin at the Los Angeles General Hospital between January 1, 1923, and January 1, 1926. All but seven of the patients were in deep coma on admission or developed it after entering. The seven exceptions were so stuporous that I have classified them simply as coma patients. Joslin's<sup>1</sup> thirty-three patients treated with insulin with two deaths were largely those in impending coma.

The onset of coma may be sudden, but this is unusual except in severe diabetics receiving large amounts of insulin who are deprived of their supply. Patients who develop coma while taking insulin are extremely resistant to treatment. Nausea, vomiting, epigastric pain, restlessness, drowsiness, weakness, air hunger, and headache are the usual danger signals indicating approaching coma. Abdominal pain, nausea and vomiting are frequently met with in children and at times are mistaken for symptoms of an acute surgical condition, as fever and leukocytosis may be present. Wild delirium is occasionally the first symptom of impending coma. Air hunger, hyperpnea or Kussmaul respiration is practically always present in diabetic coma as a very characteristic symptom. A most important sign in the differential diagnosis of diabetic coma is the soft eyeball, first described by Krause in 1904 and more fully by Riesman<sup>2</sup> in 1916. Krause observed it in twenty-two patients with diabetic coma, but failed to find it in coma from other causes. I have observed it repeatedly in diabetic coma; in several instances the intraocular tension could not be obtained with the tonometer. The cause of this phenomenon is not known.

As the onset of coma is often insidious every diabetic should be warned to communicate immediately with his doctor if any unusual symptoms appear.

**Treatment**—In October, 1923, the following rules for the treatment of diabetic coma were prepared by Dr. Phoebus Berman, medical director of the Los Angeles General Hospital, and, with certain minor modifications, are still in use:

1. Catheterize the patient and examine the urine immediately upon admission.

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